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Two Years' Experience with Rh Hemolytic Disease Reporting

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California law, since January 1 1970, has required that all pregnant women, regardless of outcome of delivery, be tested for Rho(D) type, that the mother and physician be notified of the result and that hospitals providing service to newborns report all cases of Rho(D) Hemolytic Disease to the State Department of Public Health. Although there has been only a gradual decrease in the number of deaths due to Rho(D) Hemolytic Disease of the Newborn since 1950, there has been a precipitous fall in the past two years. Since the commencement of reporting of the disease to the State Health Department the number of cases has also dropped dramatically. It is felt that because of our conscientiously administered reporting law the morbidity and mortality figures from HDN in California are accurate, in contrast to results obtained in most other states.

It is believed that this report reflects the first really accurate look at a large population for the incidence and mortality from Rho(D) HDN since the advent of widespread use of anti-Rho(D) gamma globulin. Review of the recent literature failed to reveal definitive data on recent incidence and mortality trends for Rho(D) HDN. A survey of state health departments also failed to produce data comparable with California's.

A number of factors have played a part in reducing the incidence and mortality from Rho(D) HDN in California—namely, required testing of pregnant women combined with the almost routine use of of anti-Rho(D) immune globulin in eligible women, early recognition and treatment of Rho(D) HDN, and the reduction in family size with an increasing percentage of primiparous mothers.

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SINCE JANUARY 1 1970, California law has required that all pregnant women be Rho(D) tested by an approved laboratory, and that both the woman and her physician be informed of the result. In addition, cases of suspected or diagnosed Rho(D) hemolytic disease of the newborn* (Rho(D) HDN) must be reported to the State Department of Public Health. On January 8 1971, the State Board of Public Health amended the regulations to require: (1) that the Rho(D) testing, if negative, be followed by Rho(D^u) testing; (2) that all pregnant women, regardless of the outcome of pregnancy (normal delivery, spontaneous or therapeutic abortion) be included for Rho(D) typing, and (3) that in addition to approved laboratories, such tests may be performed in an approved public health laboratory. This paper summarizes two years' experience with this program.

A survey of the recent world literature dealing with Rho(D) HDN has failed to show any reference to incidence and mortality trends due to the advent of anti-Rho(D) immune globulin. Such literature deals with the past, present, and future aspects of the disease, in either an historical approach (for example, development of exchange transfusions, pre-term delivery, amniocentesis, intrauterine transfusions, and anti-Rho(D) immune globulin) or present day treatment methods. All point up hopes that Rho(D) HDN may be eradicated through widespread use of anti-Rho(D) immune globulin, but none have attempted to document it.

Definitions

Cases and outcome of Rho(D) HDN are reported to the State Health Department of California on quarterly report forms from all maternity hospitals and hospitals licensed to receive infants under thirty days of age. The following instructions appear on the back of the reporting form:

1. *Report the following as cases:*
   a. Hemolytic Disease of the Newborn *due to Rh incompatibility.*
   b. Erythroblastosis fetalis *due to Rh incompatibility.*
   c. The only ICDA (8th revision) codes for this are *774.0* and *775.0.*
2. If the above diagnoses were not clearly made, or the only diagnoses made were Hemolytic Disease of the Newborn, or Erythroblastosis fetalis, use the following criteria:
   a. Mother must be Rh−
   b. Baby must be Rh+; or if Rh−, be D^u+.
   c. Baby must have a positive direct Coombs test (usually reported as "strongly positive").
   d. In addition, the baby may have an elevated bilirubin level.

   In such diagnoses as physiologic jaundice (Icterus Neonatorum), hyperbilirubinemia, anemia in the newborn or ABO incompatibility, *the above criteria should be applied.*
3. A diagnosis of either Hemolytic Disease of the Newborn due to Rh incompatibility or Erythroblastosis fetalis due to Rh incompatibility can occur with ABO incompatibility, and should also be reported.
4. *Do not report mothers receiving anti-Rho(D) gamma globulin (Rho GAM®) or babies with ABO incompatibility alone.*

*Both *hemolytic disease of the newborn due to Rh incompatibility* and *erythroblastosis fetalis due to Rh incompatibility* are used herein so that records of the cases are less likely to be overlooked by anyone scanning the literature for reports of the disease described by these terms.

Data Collection and Accuracy

Data have been successfully gathered from all 422 hospitals with maternity or newborn services, and the reported data are believed to be complete and accurate. Errors in reporting have been eliminated as much as possible through continuing personal communication with the persons actually filling out the reports.

In 1971 the reporting form was revised to require the person filling out the report form to designate the Rho(D) type of both mother and child. This has enabled our staff to eliminate reporting of ABO incompatibilities which had been the biggest source of error.

In order to validate deaths due to Rho(D) HDN reported to the Infant Health Unit, reported names were matched with actual death certificates filed with the Bureau of Vital Statistics in Sacramento for 1970 and 1971. Table 1 summarizes the results of this search.

The accuracy of reporting neonatal deaths due to Rho(D) HDN appears to have declined in 1971.

TABLE 1.—*Perinatal Deaths Due to Rho(D) HDN as Ascertained from Comparison of Hospital Reporting and Information on Death Certificates*

	1970	*1971*
Total number neonatal deaths ascertained ..	112	62
Number neonatal deaths reported to I.H.U.*	98	40
Number neonatal deaths recorded on death certificates	104	60
Number neonatal deaths recorded on death certificates but not reported to I.H.U. ...	14	22
Number neonatal deaths reported to I.H.U. but not recorded on death certificates ...	8	2
Fetal deaths reported to I.H.U.	67	29
Fetal deaths recorded on death certificates ..	54	27
Number fetal deaths reported to I.H.U. but not matched with death certificates	13	2

*Infant Health Unit, State Department of Public Health.

TABLE 2.—*Incidence Figures and Ratios for Hemolytic Disease of the Newborn in California (1970-1972)*

	1970				1971				1972	
	1st Q	*2nd Q*	*3rd Q*	*4th Q*	*1st Q*	*2nd Q*	*3rd Q*	*4th Q*	*1st Q*	*Totals*
Cases of Rho(D) HDN reported	355	406	392	371	316	263	243	215	219	2,780
Live births*	85,255	84,149	95,976	88,833	81,113	80,373	82,607	78,452	73,485	750,243
Cases: live births	1:240	1:207	1:245	1:240	1:262	1:315	1:341	1:367	1:336	1:270
Cases/1,000 live births	4.1	4.7	4.1	4.1	3.8	3.2	2.9	2.7	2.9	3.7
Deaths (total)	38	46	40	36	26	23	17	18	12	256
Fetal deaths	22	17	9	15	9	6	6	5	6	95
Newborn deaths	16	29	31	21	17	17	11	13	6	161

*As reported by hospitals on PKU quarterly reports.

However, the reporting of fetal deaths is more accurate. This makes for some concern about the completeness of reported cases especially in 1971 when, because of reductions in the staff, only minimal checks of hospital records could be made. There is little doubt, however, that the final number of deaths recorded is quite correct and that the number of deaths from Rho(D) HDN is approximately halved in 1971 as compared with 1970.

Results

In the winter of 1970, the Bureau of Maternal and Child Health published a summary of the first year's experience with such a program,[1] which included case reviews to determine the accuracy of reporting; the use rate of an anti-Rho(D) immune globulin; a survey of hospitals regarding availability and cost of anti-Rho(D) immune globulin; a review of a sample of reported cases of Rho(D) HDN in detail; the report of the Rho(D) HDN consultants' meeting held in July, 1970; and a table listing literature review of incidence figures. The latter table showed that the California experience in 1970 agreed with such reported incidence figures as: (1) Erythroblastosis fetalis occurs in 1 percent of all pregnancies, one-third of these are due to Rh isoimmunization (that is, 0.33 percent of all pregnancies)[2]; (2) 12 percent of marriages are with Rh incompatible people and 5 percent of these incompatible marriages result in hemolytic disease.[3]

Incidence

Review of the past nine quarters of Rho(D) HDN reporting shows that the incidence of the disease is definitely declining. The ratio of cases to live births has dropped from 1:240 to 1:336. This is well illustrated in Table 2. In looking at the number of cases per 1,000 live births, there is a drop from 4.1 in the first quarter of 1970 to 2.9 in the first quarter of 1972.

In April of 1972, a questionnaire was sent to Bureaus of Maternal and Child Health of all 50 states requesting information on the number of cases of Rh hemolytic disease occurring in each state and how these data were reported to the state health department. At the time of this report, we have received replies from 42 (82 percent) of the states. For purposes of statistical comparison the questionnaire also asked for figures on deaths from Rh hemolytic disease, total live births, fetal and neonatal deaths.

In six states cases of Rho(D) HDN are reported to the state health department. In three states data are collected from birth certificate information. Of these nine, only four states reported figures that appear to be valid when compared with the present California experience or with the incidence figures quoted in the literature. The rest of the states were not able to provide useful or comparable figures. The actual incidence ratio of cases to live births ranged in the four states from 1:644 to 1:79 (California's average incidence for nine quarters of reporting is 1:270). No state furnished figures from which the case fatality rate could be calculated.

Most of the states which responded gave us figures for their neonatal and fetal deaths. Their corresponding figures of perinatal deaths due to Rho(D) HDN seem to be grossly under-reported. For example, the number of neonatal deaths due to Rho(D) HDN divided by the total number of neonatal deaths should have been approximately 1.5 to 2 percent (based on California figures) but the 31 states' figures ranged from 0.1 to 4.0 percent (mean 1.1 percent, standard deviation 0.8 percent).

The California data indicate that Rho(D) HDN is becoming less of a problem. This can be illustrated by the decrease in infant deaths (as well as

fetal deaths) in the last 24 years. Chart 1 clearly shows the trend of deaths due to HDN as reported to the California State Bureau of Vital Statistics. In 1947 the rate of infant deaths per 1,000 live births was 0.87 as compared with 0.11 in 1971. There are several reasons for this improved situation. One reason for the decrease in both incidence and severity may be the present trend toward the limitation of family size (family planning). During the last nine years, the percentage of primiparous deliveries in California has increased from 28.7 in 1962 to 41.5 in 1970. This also tends to reduce the existing pool of Rho(D)-sensitized women of childbearing age. The disease may now be recognized early in pregnancy through typing and antibody screening of the pregnant woman's blood. The use of amniocentesis and intrauterine transfusion has enable obstetricians to keep an affected fetus in the uterus until an optimum time for delivery. Exchange transfusion as a method of treatment of the newborn affected with Rho(D) HDN has become a commonplace and safe procedure.

Since 1968, anti-Rho(D) immune globulin has

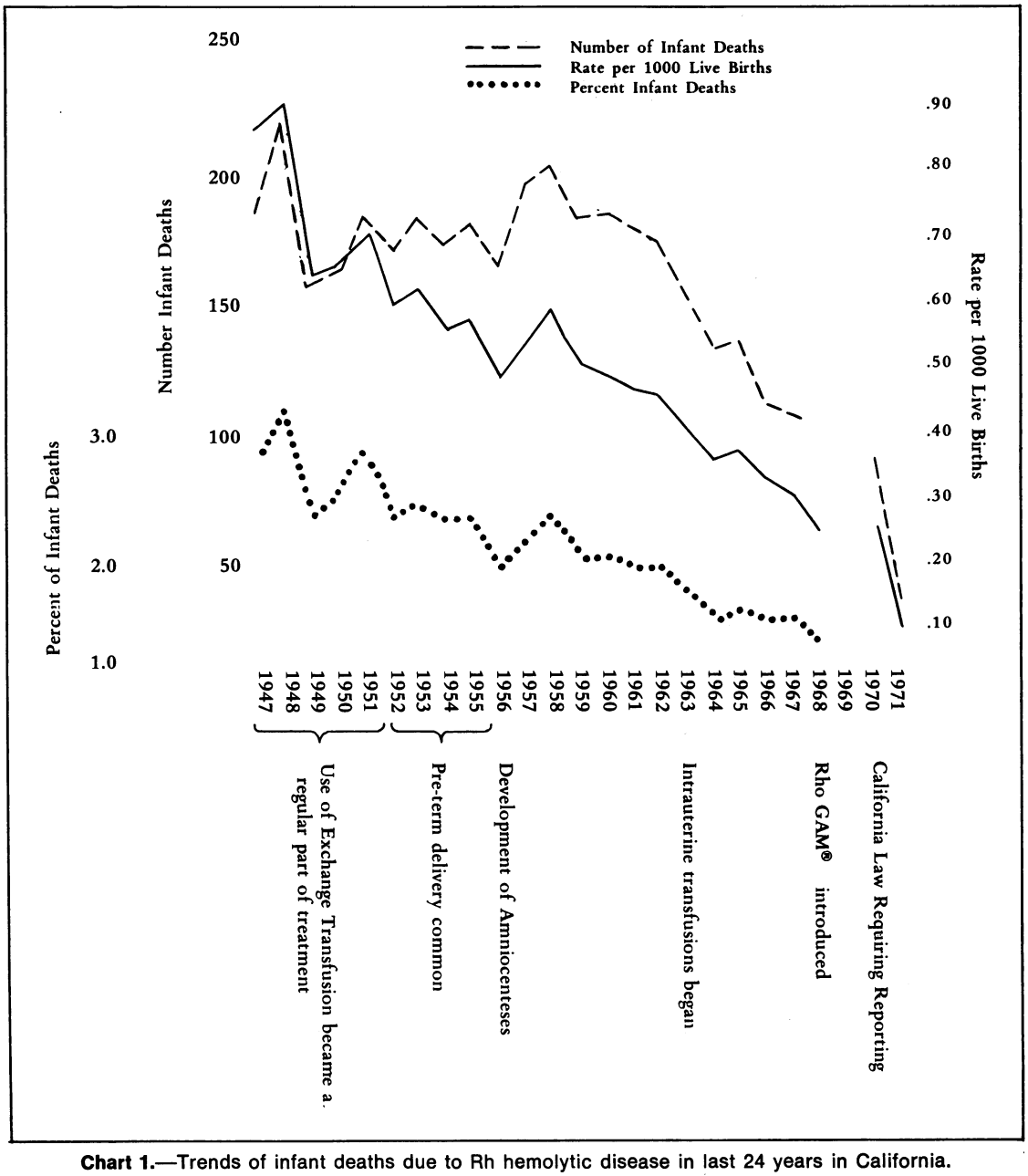

Chart 1.—Trends of infant deaths due to Rh hemolytic disease in last 24 years in California.

been available, which, when administered to an eligible postpartum woman within 72 hours of delivery of a Rho(D) or D^u incompatible fetus, will effectively block maternal sensitization to the Rho(D) antigen and thus prevent formation of anti-Rho(D) antibodies which would prove deleterious to subsequent fetuses. If the proper dosage of anti-Rho(D) immune globulin is always administered when clinically indicated, elimination of hemolytic disease due to Rho(D) incompatibility is theoretically possible. The present California regulations which require typing of all pregnant women and reporting of Rho(D) HDN have played a prominent part in encouraging the use of anti-Rho(D) immune globulin in this state. This conclusion is supported by the dramatic decline noted following implementation of this law and the other data in this report.

On the other hand California's perinatal death rate due to isoimmunization (approximately 0.45 per 1,000 deliveries) is less than half of the 1.3 per 1,000 deliveries reported in the literature[4] (Chart 1). Continued attention to prenatal testing and proper use of anti-Rho(D) immune globulin should eventually reduce the incidence to nearly zero, but progress in this regard can only be convincingly documented by careful surveillance with mandatory reporting.

REFERENCES

1. Family Health Bulletin, State of California Department of Public Health, Vol 13, No 4, Supplement, Winter 1970

2. Diamond LK, Allen FH: Erythroblastosis Fetalis. Boston, Little, Brown and Company, 1957

3. Schaffer AJ: Diseases of the Newborn. Philadelphia, W. B. Saunders Company, 1966

4. Butler NR, Bonham DG: Perinatal Mortality. London, Livingstone, 1963

"LITTLE LEAGUE SHOULDER AND ELBOW"

COMPETITIVE ORGANIZED BASEBALL PROGRAMS for boys in the 8-15 year age group have introduced new clinical entities such as "Little League shoulder and elbow" involving the throwing arms of young pitchers.

X-ray findings are characteristic of osteochondrosis of the proximal humeral epiphysis, accelerated growth, separation and fragmentation of the medial epicondylar epiphysis, and osteochondrosis of the capitellum of the humerus and head of the radius. These result from repeated traction strains on the vulnerable un-united epiphyses of young pitchers.

Treatment is primarily preventive: Rule changes to limit the amount of throwing by pitchers should be made and youngsters must be encouraged to report elbow soreness immediately. Coaches should be discouraged from teaching adult techniques in throwing, as the conditions are often irreversible. It is urged that orthopedic consultation be obtained whenever injury is suspected.

Prepared by the Committee on Medical Aspects of Sports and Physical Fitness.